DOCUMENT RESUME

ED 247 034 PS 014 565

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TITLE Cognitive Style and Children's Learning: Individual Variation in Cognitive Processes.
INSTITUTION ERIC Clearinghouse on Elementary and Early Childhood Education, Urbana, Ill.
SPONS AGENCY National Inst. of Education (ED), Washington, DC.
PUB DATE 84
CONTRACT 400-83-0021
NOTE 33p.; To be published as a chapter in "Current Topics in Early Childhood Education," Volume VI, 1985 (est.), Ablex Publishing Corporation, Norwood, NJ., Lilian G. Katz, Editor.
PUB TYPE Information Analyses - ERIC Information Analysis Products (071)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Academic Achievement; *Cognitive Style; Elementary Education; *Elementary School Students; *Field Dependence Independence; Intelligence Quotient; *Learning; *Measures (Individuals); Preschool Children; Preschool Education; Research Needs; *Teaching Styles

ABSTRACT

Cognitive style is a psychological construct concerning the manner in which individuals differ from one another in intellectual functioning. Researchers in the area have amassed evidence suggesting that cognitive style affects the way students learn, the way teachers teach, and the way students and teachers interact. Focusing on cognitive style and children's learning, this paper (1) provides a brief overview of the field dependence/independence dimension of cognitive style; (2) defines that dimension; (3) describes the most popular instruments used to measure cognitive style; (4) discusses the advantages and disadvantages of cognitive flexibility; (5) identifies the relationship between cognitive style and intellectual functioning, including academic achievement; and (6) describes students' learning styles and teachers' teaching styles. Implications for future research and practice are pointed out. It is concluded that greater attention should be given to learners' cognitive styles in order to better match educational resources and the abilitites of students to make use of those resources. (RH)

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COGNITIVE STYLE AND CHILDREN'S LEARNING: INDIVIDUAL VARIATION IN COGNITIVE PROCESSES

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This publication was prepared with funding from the National Institute of Education, U.S. Department of Education, under contract number 400-83-0021

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Cognitive style is a psychological construct concerning the manner in which individuals differ from one another in intellectual functioning. Researchers in the area of cognitive style have amassed evidence that suggests that cognitive style affects the way students learn, the way teachers teach, and the way students and teachers interact with one another in the school context. The purpose of this discussion is to provide a brief overview of the field dependence/independence dimension of cognitive style, define that dimension, describe the most popular instruments used to measure cognitive style, discuss the advantages and disadvantages of cognitive flexibility, identify the relationship between cognitive style and intellectual functioning (including academic achievement), and describe students' learning styles and teachers' teaching styles. Implications for future research and practice are also drawn.

Theoretical Perspectives

Research on cognitive style was initiated in the early 1950s by Witkin and associates (Witkin, 1974; Witkin, Hertzman, Machover, Meissner, & Wapner, 1954/1972), who originally referred to the construct as field dependence versus field independence. Presently, some researchers prefer using the term "psychological differentiation" (Oltman, Goodenough, Witkin, Freedman, & Friedman, 1975; Witkin, Dyk, Faterson, Goodenough & Karp, 1962/1974) rather than field dependence/independence; others favor using the term "field articulation" (global versus analytic) (Wallach, 1962). Regardless of the term used, the psychological construct characterizes individuals by distinguishing the ways in which they cope with complex and confusing circumstances as well as the manner in which they provide cognitive responses to different situations.

Field dependence/independence is a dimension of cognitive style that defines individual modes of perceiving, remembering, and thinking as well as individual ways of apprehending, storing, transforming, and processing information. The term "cognitive style" most frequently denotes consistencies in individual ways of functioning in a variety of behavioral situations. This psychological construct denotes a domain of observable behaviors. Such observability of behavior is one reason many researchers employ cognitive style to differentiate individuals in their modes of functioning, classifying them as having field dependent (global or undifferentiated) and field independent (analytic or differentiated) cognitive styles.

In the field dependent mode, individuals respond to the context as a whole. They react in an impulsive way without reflecting on and analyzing the situation. Field dependent persons tend to be sociable, are interested in people, exhibit a high reliance on the surrounding field, rely on authority, observe the faces of those around them for information, prefer to be with people, and experience their environment in a relatively global fashion by conforming to the effects of the prevailing field.

In the field independent mode, individuals separate the various components or features of circumstances from one another. They disregard any irrelevant characteristics in the situation, reflecting on the situation, analyzing it, and providing a conceptual response. Field independent persons tend to be analytic, autonomous, socially detached, removed, cold, distant, oriented towards active striving, and self-aware. They analyze and structure incoming information. Of course, these descriptions represent extremes; in reality, all individuals manifest some elements of both cognitive styles.

The modes of functioning in cognitive style are highly pervasive and consistent and are associated with educational factors. In tasks requiring

incidental memory of social words (Fitzgibbons, Golberger & Eagle, 1965; Minard & Mooney, 1969) and the memory of faces (Messick & Damarin, 1964), field dependent subjects perform better than field independent subjects. In relation to school, field dependent students are favorably oriented to subject areas that relate most directly to people, such as the social sciences. Field independent students favor impersonal, abstract subjects such as mathematics and the physical sciences. Field dependent students learn better with material containing social content because they are attentive to social cues, which they utilize in learning (Witkin, 1974). They also rely on externally defined goals and reinforcements. Field independent students define their own goals and reinforcements, prefer impersonal and abstract material, and use mediators in learning as they abstract from their experiences. Field dependent teachers tend to make greater use of discussion and discovery strategies to enhance interpersonal relationships, whereas field independent teachers employ direct techniques that minimize interpersonal relationships, such as lecturing.

Measures

Field dependence/independence has been the most widely known and thoroughly researched dimension of cognitive style. Witkin and other experts in the area have developed reliable and valid instruments to assess cognitive styles. Saracho (1983-a) describes the following measures as the most widely used:

Rod-and-Frame-Test (RFT). The RFT is an apparatus with a luminous square that moves independently of a frame; both are pivoted at their centers to make the frame tilt to the left or to the right. Subjects are tested in a darkened room, where they are asked to adjust the rod to an upright position.

Tilting-Room Tilting Chair Test (TRTC). The TRTC assesses an individual's visual and bodily perception in relation to the upright position. This apparatus conceives the body, rather than an external object, as the object to adjust. Subjects sit in a chair suspended into a small box-like room. The chair and room tilt clockwise or counterclockwise independently of each other. As subjects sit on the chair, the examiner tilts the chair and room. Subjects then are asked to adjust their body to an upright position.

Articulation of the Body-Concept Scale (ABC). The ABC Scale requires pictures of males and females to be drawn by the subject. The drawings are rated according to specified criteria to determine the subjects' degree of field dependence or independence. A minimum of two judges independently rate each set of drawings.

Embedded Figures Test (EFT). The EFT is a paper-and-pencil test that requires the subject to locate a simple figure within a complex figure. This standardized measure consists of a series of 24 complex figures.

These measures have been standardized, and their reliability has been widely investigated. Specifically, reliability for the various measures has been assessed as follows: the RFT ranges from .66 to .92 (Gardner, Jackson, & Messick, 1960); the TRTC ranges from .74 (Loeff, 1961) to .90 (Linton, 1952); the EFT ranges from .72 (Saracho, 1980) to .95 (Gardner et al., 1960); the Preschool EFT, a measure of cognitive style for young children, ranges from .74 to .91 (Coates, 1972); and the ABC Scale ranges from .72 to .92 (Saracho, 1982, 1983-d).

Researchers have used all of these measures to study cognitive style. Witkin (1974) affirms that the different scores on these tests reflect the subjects' perceptual skills as well as their underlying thinking styles.

Witkin, Goodenough, and Karp (1967) gathered substantial evidence to support a consistency of these measures when used with cross sectional groups (ages 8 to 21). It is evident that consistency exists among groups and with respect to the relationship among the different instruments employed to study cognitive style. Therefore, researchers feel a high degree of confidence that cognitive style can be adequately assessed with the above-mentioned instruments.

Recently, another instrument assessing different dimensions of cognitive style has been developed. Thompson and Pitts (1981) have developed and validated the Children's Cognitive Style Assessment (CCSA) to measure several dimensions of cognitive style. They found this instrument reasonably valid, although the teachers who assessed the children's perceptions of cognitive styles had difficulty distinguishing between two dimensions: breadth of categorization and field dependence/independence. However, the results strongly support the validity of the field dependence/independence dimension scale of the CCSA.

Measures of cognitive characteristics relating to intellectual abilities, information-processing skills, and subject-matter knowledge are necessary for evaluating educational theory and practice. Personality characteristics can also be classified as aptitude since they predict students' responses to instruction and the educational environment. Although some educators view personality characteristics as noncognitive, these characteristics do include cognitive attributes and can predict students' current and future achievement by providing information on learning ability (see Bloom, 1976; Cronbach & Snow, 1977; Linn & Swiney, 1981; Messick, 1982). Scores on cognitive measures also can be used to diagnose students' learning strengths and needs in order to plan their instructional program (Messick, 1979).

Cognitive Flexibility

Some educators suggest that it is important not only to identify cognitive style but also to be able to modify it to help individuals employ the characteristics of both field dependence and field independence. Cognitive flexibility, the degree that individuals are able to vary their information processing techniques in relation to specific activities, has been proposed as an educational goal by researchers (e.g., Battig, 1979; Davis & Cochran, 1982; Davis & Frank, 1979; Macleod, 1979; Ramírez & Castañeda, 1974; Saracho & Spodek, 1981). However, it is uncertain whether such modification can be achieved.

Some researchers indicate that field independent persons have more flexibility in selecting effective strategies in a range of activities. Kogan (1971), for example, believes that field dependent individuals are more resistant to cognitive style modification than are field independent individuals. The difference between field dependent and field independent students could possibly relate to the wider range of alternative opportunities they receive, to their willingness to use a variety of techniques, and/or to their ability to become aware that a specific strategy is not effective. Information-processing systems may differ according to individuals' cognitive flexibility and depending on their ability to function using the characteristics of the cognitive style that is required for the particular task activity.

The issue of modifiability of cognitive style is important because of its implications for facilitating or stifling learning. It is possible for a specific style to be maladaptive in a particular instructional context but valuable in other contexts. For instance, a teacher may plan a mathematics lesson, considered to be a field independent activity, for a field dependent

child. This child will have difficulty with formal instruction in mathematics and will probably learn the concept better through a social activity, such as dramatic play. In order for this child to be able to learn mathematics in an abstract mode, his or her cognitive style would need to be modified to ensure adequate functioning in a field independent way. On the other hand, the field independent child can easily perform cognitive problem-solving tasks but may be deficient in performing tasks involving social sensitivity, interpersonal harmony, and other important affective skills.

Kogan (1971) suggests a guiding question for those interested in modifying cognitive functioning: Will the change enhance the individual's cognitive flexibility? One desirable goal of such modification is to assist individuals to acquire the capacity to shift their cognitive approach based on changing task requirements. Individuals who have become "locked" into a customarily adaptive manner of cognition may find that their usual approach can be harmful when applied to certain tasks. In attempting to enhance anyone's cognitive flexibility, it is important to consider whether the modification will actually alter functioning in a way that will allow the individual to deliberately choose a style of cognition rather than be compelled to approach a given problem in a specific way. It is also important to consider whether, as a result of heredity, personal constitution, or early experiences, some styles are profoundly inherent in some persons and thus cannot be changed.

Ramírez and Castañeda (1974) have found that, depending on the activity, task, or specific atmosphere in which individuals are functioning, many adults and children manifest both field dependent and field independent cognitive styles, thus exhibiting "bicognitive development." In varying circumstances, individuals may cooperate or compete, solve prob-

lems using inductive or deductive reasoning, and react to or ignore the social milieu. These individuals possess a repertoire of techniques that may be employed in learning and problem-solving processes.

Further information has been provided by Saracho (1983-b), who mapped children's cognitive styles to obtain profiles describing thinking, learning, and performance. In brief, cognitive style mapping is a formalized set of self-descriptive statements. Based on the characteristics of field dependence and field independence and on descriptions included in the profiles, participating children were characterized according to cognitive style. The profiles suggested that subjects had characteristics of both cognitive styles. In analyzing the cognitive mapping, the investigator found that 5-year-olds relied on their own interpretation of symbols (a field independent characteristic). In addition, children inferred meaning by defining things in order to understand them (a field dependent characteristic), reasoned as they compared and contrasted characteristics or measurements (a field independent characteristic), and synthesized a number of dimensions or incidents into a unified meaning (a field independent characteristic). When children used cultural determinants to interpret symbols and their meaning, their own interpretations influenced their expression of symbol meaning (a field independent characteristic), but children were also influenced by members of their families or by close friends in their interpretations of the meanings of symbols (a field dependent characteristic).

Ramírez and Castañeda (1974) suggest that individuals can be taught to extend their repertoires beyond those characteristics and behaviors associated with their own cognitive styles. Experiences that match children's cognitive styles can be provided to make children feel comfortable and secure. Then teachers can gradually introduce activities that do not

match the children's cognitive styles. A degree of such cognitive dissonance can assist children in making the transition. Saracho and Spodek (1981) suggest that field independent children can participate in activities such as chairing a committee or working with a group to make gifts for an ill classmate. Such activities require social sensitivity, a field dependent attribute. On the other hand, field dependent children can participate in activities that demand a field independent application of analytic skills, such as working alone in solving a problem relating to a building structure or mathematics task. In this way, individuals can respond more flexibly to a range of data sources in their interactions with ideas and people (Saracho & Spodek, 1981). Although both Ramírez and Castañeda (1974) and Saracho and Spodek (1981) suggest that persons can learn to function according to a cognitive style different from their preferred one, additional developmentally oriented research on cognitive flexibility and on bicognitive development in individuals from different groups needs to be conducted.

Intellectual Functioning

Studies in cognitive style (e.g., Coates, 1975; Goodenough & Karp, 1961; Linn & Kyllonen, 1981; Schimek, 1968; Sherman, 1967) have indicated a relationship between field dependence/independence and many other elements of intellectual functioning. Some research suggests that field dependent individuals may not perform as efficiently as field independent individuals on standardized intelligence tests. Conversely, a major concern in the testing for cognitive style is the impact that an individual's intelligence has on his or her performance on such tests. Some researchers (e.g., Bieri, Bradburn, & Galinsky, 1958; Spotts & Mackler, 1967) have found relationships between measures of intelligence and some tests of cognitive style. Goodenough and Karp (1961) have supported the

hypotheses that some intellectual and perceptual tests have a common requirement for overcoming embedding contexts and that relationships obtained between field dependence/independence and standardized tests of intelligence are based on this common factor. Goodenough and Karp's (1961) study was part of a larger investigation conducted by Witkin et al. (1974), which found significant correlations between scores on field dependence/independence tests and on the Stanford-Binet and WISC tests of intelligence. However, Witkin et al. (1974) have denied the importance of intellectual factors in the field dependence/independence dimension. Rather, they suggest that parallels in the structure of subtests account for the significant relationships found between intelligence scores and perceptual scores of cognitive style and that, since the measures require the individual to overcome embedded contexts, these relationships should be anticipated.

Dubois and Cohen (1970) challenged the interpretation of Witkin et al. (1974) concerning the relationship between measures of field dependence/ independence and intellectual functioning. The former investigators hypothesized that significant relationships can be found between measures of field dependence/ independence and a number of measures of intellectual ability that do not require subjects to overcome embedded contexts. Their results indicate that the RFT may be less "contaminated" by intelligence than the EFT. All but two of these correlations (English/Art and Music) were low but statistically significant between field dependence/ independence measures and past achievement measures, which ostensibly have little relationship to embedded contexts, spatial-perceptual skills, or nonverbal organization. All correlations were negative, and the correlations noted were similar to intercorrelations found among measures of intellectual achievement. Those who perceive field independence simply as

a semi-specific factor of ability or intelligence may view such results as atypical; thus, it would seem that researchers who have found that field independent individuals also possess other ability and intelligence factors will likely not accept such results, regardless of the low correlations found.

Dubois and Cohen (1970) assume that field dependence/independence can be considered one factor of intelligence. If the acquired generality and stability of the external correlates of field dependence/independence assessments rely to some extent on their sizeable correlations with indices of a more generalized intellectual ability, and if the intellectual factor is removed, field dependence/independence may not have enough power to generate differences on specific dimensions. Dubois and Cohen propose that researchers thoroughly investigate the relationship between ability measures and field dependent/independent measures.

Zigler (1963) and Vernon (1972) have assumed that knowledge of field dependence/independence is not enough to predict intelligence scores. Vernon has extensively reviewed the literature and has determined that the group paper-and-pencil tests of cognitive style fail to define a factor on intelligence tests.

Coates (1975) duplicated Goodenough and Karp's (1961) study with 4½-year-old children. The Preschool EFT loaded a common factor that also exists in the WPPSI Block Design and Geometric Design. This factor was concluded to be a perceptual analytic factor that Goodenough and Karp obtained with older children (ages 10 and 12).

Pedersen and Wender (1968) also examined field dependence/ independence and personality in nursery school children between the ages of 2 and 6. Small and irregular correlations in the anticipated direction were

found between four clusters and children's performance on the Preschool EFT, WISC performance (nonverbal), and Kagan's relational (but not analytic) scores.

Learning Styles

Educators are continually examining ways to adapt instructional conditions and techniques to the characteristics of individual students. In making such adaptations, children's age, intelligence, and interests have been considered. Reiff (1982) concludes that academic performance can be enhanced by assessing the students' learning styles and planning, as well as by selecting appropriate materials and strategies.

Goodenough (1976) reviewed the literature on the relationship of field dependence/independence to learning and memory, concluding that field dependent and field independent individuals vary more consistently in the way they learn or memorize than they do in the effectiveness of either process. He proposed two hypotheses: (a) field independent individuals are probably more advanced developmentally than field dependent individuals; and (b) assuming that field dependent and field independent individuals employ their cognitive processes differently, the efficiency of their performance will vary under some conditions.

Research on concept learning supports Goodenough's hypothesis that field dependent and field independent individuals utilize various learning processes without manifesting different performance; however, it has been found that field independent persons usually perform more efficiently. Since research indicates that cognitive style affects differences in cognitive activities, Hester and Tagatz (1971) concluded that cognitive style can be considered an inherent organismic variable. Therefore, field dependent

and field independent cognitive styles are similar to conservative and commonality strategies regarding the degree of dependence on analysis in concept attainment tasks. Specifically, these researchers sought to determine which cognitive style would help students acquire concepts more effectively when they were instructed with techniques appropriate for their cognitive styles. Using a repeated measures design, they tested the relationships among the following variables: (a) cognitive style (analytic or global), (b) instruction (conservative or commonality), and (c) achievement on 10 concept attainment tasks. The investigators found that efficiency in concept attainment may depend on cognitive style. Field independent subjects psychologically grasped the nature of concept attainment tasks upon initial exposure to the tasks and determined the relevant elements within the stimulus field faster than did the field dependent subjects. It was also found that individuals with a specific cognitive style attained concepts efficiently when they were taught with a solutional strategy appropriate to that style. Field independent individuals were able to perform effectively under either instructional treatments, whereas field dependent individuals performed as effectively as field independent subjects when instructed in a strategy consistent with their cognitive style. The learning performance of field dependent subjects decreased when they were taught with a technique inconsistent with their dominant cognitive style. All subjects received the same initial exposure to information processing.

Since both groups performed equally well with strategies devised for field independent individuals, Hester and Tagatz (1971) concluded that, although initial exposure to information processing may be beneficial to subsequent performance on concept attainment tasks, more than exposure

alone is needed to overcome the individual differences in cognitive functioning under different kinds of instructional techniques. Prior learning in concept attainment can influence cognitive style to facilitate learning; learning efficiency can be stifled if these requirements are not met. Field dependence/independence is a unique factor that affects a range of components integrated in learning and memory.

As noted earlier, Goodenough (1976) asserted that field dependent and field independent individuals differed more in their learning and memory processes than they did in how much they learned and remembered. Davis and Frank (1979) emphasized developmental differences between field dependent and field independent learners in the effectiveness of performance, noting that field independence increases with age (up to 16 years). Increase in field independence does not occur only as a result of experience but is to some extent a normal pattern of individual development. Specifically, these investigators found that memory performance (such as concept learning) of field dependent learners tends to be poorer than that of field independent learners if the task requires an increased amount of information to be processed in working memory. When interference occurs and when the information load is high, field independent students tend to be more effective than field dependent students in the recall of information stored in short term memory. In contrast, if information is low and no interference occurs, field dependent and field independent students do not differ. The studies reviewed by these investigators suggest the need for further speculation and investigation of memory and developmental differences in field dependent and field independent learners.

Davis and Cochran (1982), in reviewing those research studies published after Goodenough's (1976) review, suggest that three stages of information processing characterize field dependent and field independent individuals. These stages include selective attention, encoding, and long term memory processes.

Attention is an information processing paradigm including tasks of dichotic listening, signal detection, and visual search. The research studies reviewed by Davis and Cochran (1982) showed that field dependent persons have difficulty attending to relevant cues, especially when distracting cues are present.

Encoding has been related to attentional processes in tasks that require encoding specificity, digit span, and working memory tasks. Although field dependence is associated with differences in encoding processes, when a restricted amount of information is processed, few or no differences are found between field dependent and field independent students. In contrast, if a large degree of information is processed, field independent learners process information more effectively than do field dependent learners.

Long term memory has been found in most recent research studies to relate to performance on associative learning and memory tasks, indicating that organizational processes affect memory differences in field dependent and field independent individuals. Field independent learners are better than field dependent individuals in selective attention, encoding, and long term memory processes.

The stages described above indicate that there are differences in the information-processing attributes of field dependent and field independent persons. Davis and Cochran's (1982) review suggests that field indepen-

dent persons are more effective than field dependent persons in concept attainment, selective attention, and long term memory processes. The degree of field dependence/independence affects students' learning and techniques outcomes (e.g., field dependent students prefer material with social content, and field independent students prefer material with impersonal content). Thus, it is essential that students' cognitive styles be considered in planning educational programs.

Teaching Styles

The literature on teaching styles reflects findings varying to some degree. According to Saracho (1983-c), several styles interact in educational settings, and a number of interactions between children and teachers take place in a classroom. Researchers have suggested matching achievement styles to instructional environments (Ross, 1980), matching students' cognitive responses to teaching skills (Winnie & Marx, 1980), and matching students' preferences to the teaching style (Reiff, 1982). Researchers usually examine teaching styles by exploring the teachers' and students' perceptions of each other. Witkin, Moore, Goodenough and Cox (1977) reviewed the relationship of teaching style to teachers' cognitive style. Field dependent teachers favored a warm and personal learning milieu and involved students in establishing goals and guiding their learning. Conversely, field independent teachers strived to express the cognitive aspects of teaching and preferred to organize and direct the learning. While field dependent teachers tend to employ discussion methods, field independent teachers utilize more lecture methods. Wu (1968) supports the idea that field dependent teachers favor greater interaction with their students, whereas field independent teachers favor teaching situations that are impersonal in nature and oriented toward more abstract cognitive aspects of instruction.

In a study by Moore (1973), field dependent teachers employed questions primarily in evaluating pupils' learning and after the instructional phase was finished. Emmerich, Oltman, and McDonald (cited in Witkin et al., 1977) concluded that field dependent teachers favored class discussion over teacher lectures as a technique to enhance pupils' learning. In addition, as compared with field independent teachers, field dependent teachers more greatly favored high student involvement in structuring the learning activity as a teaching strategy. Field independent teachers employed questions as instructional tools more frequently than did field dependent teachers as they introduced new units and responded to students' answers. Reinforcement also varied based on the teachers' cognitive style. Field independent teachers were found to more greatly favor feedback indicating errors (negative assessment) and explaining the underlying error to promote learning.

Ekstrom (1976) examined the relationship between certain cognitive and attitudinal characteristics and the instructional mode of elementary school teachers. At both second and fifth-grade levels, few of the teacher scores indicated a consistent relationship to any teaching behavior exhibited in either reading or mathematics instruction. Field dependent teachers were more concerned with behavioral control in the classroom than were field independent teachers. In addition, field dependent and field independent teachers viewed the requirements for the grades and subject areas differently. Teachers did not perceive training as a homogeneous task but chose different teaching styles based on their perceptions of the demands of the instructional task. Cognitive flexibility in teachers permits them to employ several organizational techniques (such as using aides, various groupings, etc.) to provide individual instruction.

Mahlios (1981) found that approaches used in classroom teaching relate to teachers' cognitive styles, although observations of teachers' approaches did not indicate the way teachers differ in meeting students' learning styles. Specifically, Mahlios investigated the differences in teaching preferences and instructional approaches between field dependent and field independent teachers observed under special research conditions, attempting to determine whether such differences are representative of cognitive style differences in actual classroom teaching. He examined (a) the frequency and context of instruction (whole groups versus small groups and individual students), (b) the function of questions teachers ask children, and (c) the frequency and kind of corrective feedback teachers use. Field dependent teachers interacted significantly more often with their pupils in small groups and individually, whereas field independent teachers initiated a significantly greater number of academic interactions with their pupils as a whole class.

Mahlios (1981) also found that field dependent teachers asked more factual questions, whereas field independent teachers asked more analytic level questions. In addition, field independent teachers asked more academic questions than did their field dependent peers. Thus, field dependent teachers preferred to encourage pupils to apply principles. Field independent teachers also yielded more corrective feedback statements after pupils' failures and conceptually elaborated and extended their feedback after pupils' successful statements. Apparently, field dependent and field independent teachers vary in their academic interactions, in the context of their interactions with pupils, in the conceptual level of instructional activity, and in the type of feedback they give their students.

Coward, Davis, and Wichern (1978) investigated the variation of eleventh- and twelfth-grade students' perceptions of the "ideal" teacher. They examined the perceptions of field dependent and field independent pupils to determine whether these perceptions systematically reflect a preference for task-oriented or socially oriented teacher characteristics. Students ranked five characteristics indicating a more social orientation to teaching and five other characteristics reflecting a greater task orientation to teaching. The more field independent students ranked three of the teacher characteristics in a way significantly different from that of their field independent peers, ranking the trait "conducts informative lectures" highest. In comparison, field dependent students gave the highest rankings to two of the task-oriented traits ("well organized" and "clearly explains directions for assignments"). Coward et al. suggest that field dependent pupils who valued task-oriented teacher characteristics more highly than did field independent pupils may have been expressing a need for teachers who exhibit the characteristics they themselves lack.

Packer and Bain (1978) found that students' assessments of teachers were affected by the teachers' cognitive styles, with the more field dependent teachers receiving a greater number of positive ratings than the more field independent teachers. They found that, for field dependent pupils, field dependent teachers were superior to field independent teachers; for field independent students, field independent teachers were superior. Saracho and Spodek (1981) suggest that field independent students might best be assigned to field independent teachers. However, their data differ from Packer and Bain's in relation to the other assignments. They suggest, based on rankings of achievement scores, that for optimal academic success placements might be prioritized as indicated in Figure 1.

Frank and Davis (1982) suggest an assignment similar to Saracho and Spodek's (1981). The former researchers examined 64 dyads of students either matched or mismatched on field dependence/independence to see if they differed from each other regarding the effectiveness of their performance. They found that matched dyads with field independent students performed significantly better than matched dyads with field dependent students, with the mismatched dyads falling in between. Therefore, field independent students perform better than do field dependent students when placed with field dependent teachers.

Insert Figure 1 about here

In examining second- and fifth-grade teachers' perceptions of students based on cognitive style, Saracho (1980) found that field dependent teachers make more negative assessments than field independent teachers when evaluating field independent students, whereas field independent teachers make more positive assessments of field dependent students than do field dependent teachers. Saracho and Dayton (1980) found that field independent students assigned to field independent teachers achieved greater gains on a standardized achievement test than did field independent students with field dependent teachers.

In a recent study with first- and third-grade children, Saracho (1983-d) found significant relationships among cognitive style, sex, and age. With first-grade children, both field dependent and field independent teachers underestimated field dependent and field independent students; with third-grade children, field dependent teachers overestimated field dependent and field independent students. Field independent teachers'

assessments of field dependent and field independent students' performances were similar to the children's scores on a standardized achievement test. Specifically, Saracho (1982) reported the following in relation to test scores:

1. Field dependent teachers underestimated their field dependent male and female students but underestimated their field dependent male students more.
2. Field dependent teachers overestimated their field independent female students but underestimated their field independent male students more than they underestimated their field dependent male and female students.
3. Field dependent teachers assessed their field independent female students' performance to be similar to that measured on the test.
4. Field independent teachers underestimated their field independent male students.
5. Field independent teachers overestimated their field dependent male students and underestimated their field dependent female students.

The inconsistency of these results with those of other studies suggests that relationships may be complex and that further research, studying a large number of factors and using different methodologies, needs to be conducted in this area.

The area of teachers' cognitive styles and instruction and the relationship of teachers' cognitive styles to students' characteristics and learning styles has not been greatly studied, yet it seems plausible to suggest that methods of instruction are related to students' cognitive styles. Field dependent students may learn more from a didactic mode of

teaching in which rules and principles are explicitly stated instead of induced. However, educators may optimize the learning of subject matter at the price of never providing field dependent students with the opportunity to make a discovery during their school career. Educators cannot afford an exclusive preoccupation with mastery of subject matter; they need to consider the students' individual modes of thinking as well.

Much research still needs to be conducted, but the work already completed and in progress suggests that greater attention to variability in the cognitive styles of learners can help educators provide a better match between educational resources and the ability of students to utilize these resources. Thus, by responding more broadly to individual differences among children, educators can provide greater equality of educational opportunity to all.

REFERENCES

Battig, W. F. (1979). Are the important "individual differences" between or within individuals? Journal of Research in Personality, 13, 546-558.

Bieri, J., Bradburn, W. M., & Galinsky, M. D. (1958). Journal of Personality, 26, 1-12.

Bloom, B. S. (1976). Human characteristics and school learning. New York: McGraw-Hill Book Company.

Coates, S. (1972). Preschool Embedded Figures Test. Palo Alto, CA: Consulting Psychologists Press.

Coates, S. (1975). Field independence and intellectual functioning in preschool children. Perceptual and Motor Skills, 41, 251-254.

Coward, R. T., Davis, J. K., & Wichern, R. L. (1978). Cognitive style and perceptions of the ideal teacher. Contemporary Educational Psychology, 3 (3), 232-238.

Cronbach, L. J., & Snow, R. E. (1977). Aptitudes and instructional methods: A handbook for research on interaction. New York: Irvington Publishers.

Davis, J. K., & Cochran, K. F. (1982, March). Toward an information processing analysis of field independence. In R. E. Schutz (Chair), Trends in cognitive style research: Directions and dilemmas. Symposium conducted at the meeting of the American Educational Research Association, New York.

Davis, J. K., & Frank, B. M. (1979). Learning and memory of field independent-dependent individuals. Journal of Research in Personality, 13, 469-479.

Dubois, T. E., & Cohen, W. (1970). Relationship between measures of psychological and intellectual ability. Perceptual and Motor Skills, 31, 411-416.

Ekstrom, R. B. (1976). Teacher aptitudes, knowledge, attitudes and cognitive style as predictors of teacher behavior. Journal of Teacher Education, 27 (4), 329-331.

Fitzgibbons, D., Goldberger, L., & Eagle, M. (1965). Field dependence and memory for incidental material. Perceptual and Motor Skills, 21, 743-749.

Frank, B. M., & Davis, J. K. (1982). Effect of field-independence match or mismatch on a communication task. Journal of Educational Psychology, 74, 23-31.

Gardner, R. W., Jackson, D. N., & Messick, S. J. (1960). Personality organization in cognitive controls and intellectual abilities. Psychological Issues, 2 (4, Serial No. 8).

Goodenough, D. R. (1976). The role of individual differences in field dependence as a factor in learning and memory. Psychological Bulletin, 83, 675-794.

Goodenough, D. R., & Karp, S. A. (1961). Field dependence and intellectual functioning. Journal of Abnormal and Social Psychology, 63 (2), 241-246.

Hester, F. M., & Tagatz, G. E. (1971). The effects of cognitive style and instructional strategy on concept attainment. The Journal of Genetic Psychology, 85 (2), 229-237.

Kogan, N. (1971). Educational implications of cognitive styles. In G. S. Lesser (Ed.), Psychology and educational practice (pp. 242-292). Glenview, IL: Scott, Foresman and Company.

Linn, M. C., & Kyllonen, P. (1981). The field dependence-independence construct. Journal of Educational Psychology, 73 (2), 261-273.

Linn, M. C., & Swiney, J. F. (1981). Individual differences in formal thought: Role expectations and aptitudes. Journal of Educational Psychology, 73 (2), 274-286.

Linton, H. B. (1952). Relationships between mode of perception and tendency to conform. Unpublished doctoral dissertation, Yale University, New Haven, CT.

Loeff, R. G. (1961). Embedding and distracting field contexts as related to the field dependence dimension. Unpublished master's thesis, Brooklyn College, Brooklyn, NY.

MacLeod, C. M. (1979). Individual differences in learning and memory: A unitary information processing approach. Journal of Research in Personality, 13, 530-545.

Mahlios, M. C. (1981). Instructional design and cognitive styles of teachers in elementary schools. Perceptual and Motor Skills, 52, 335-338.

Messick, S. (1979). Potential uses of noncognitive measurement in education. Journal of Educational Psychology, 71 (3), 281-292.

Messick, S. (1982). Cognitive styles in educational practice (Research Bulletin No. RR-8). Princeton, NJ: Educational Testing Service.

Messick, S., & Damarin, F. (1964). Cognitive styles and memory for faces. Journal of Abnormal and Social Psychology, 69, 313-318.

Minard, J. C., & Mooney, W. (1969). Psychological differentiation and perceptual defense: Studies of the separation of perception from emotion. Journal of Abnormal Psychology, 74, 131-139.

Moore, C. A. (1973). Styles of teacher behavior under stimulated teaching conditions. Dissertation Abstracts International, 34, 3149A - 3150A. (University Microfilms No. 73-30,449).

Oltman, P. K., Goodenough, D. R., Witkin, H. A., Freedman, & Friedman, F. (1975). Psychological differentiation as a factor in conflict resolution. Journal of Personality and Social Psychology, 32, 730-736.

Packer, J., & Bain, J. D. (1978). Cognitive style and teacher-student compatability. Journal of Educational Psychology, 70 (5), 864-871.

Pedersen, F. A., & Wender, P. H. (1968). Early social correlates of cognitive functioning in six-year-old boys. Child Development, 39, 185-193.

Ramírez, M. III, & Castañeda, A. (1974). Cultural democracy, bicognitive development, and education. New York: Academic Press.

Reiff, J. (1982, April). Identifying learning preferences of young children. Paper presented at the meeting of the Association for Childhood Education International Conference, Atlanta, GA.

Ross, H. G. (1980). Matching achievement styles and instructional environments. Contemporary Educational Psychology, 5 (3), 216-226.

Saracho, O. N. (1980). The relationship between teachers' cognitive styles and their perceptions of their students' academic achievement. Educational Research Quarterly, 5, 40-49.

Saracho, O. N. (1982, March). The cognitive style of teachers and their perceptions of their matched and mismatched children's academic competence. Paper presented at the annual meeting of the American Educational Research Association, New York.

Saracho, O. N. (1983-a). Assessing individual differences in young children. Studies in Educational Evaluation, 8, 229-236.

Saracho, O. N. (1983-b). Cognitive style and Mexican American children's perceptions of reading. In T. H. Escobedo (Ed.), Early childhood education: A bilingual perspective (pp. 201-221). New York: Teachers' College Press.

Saracho, O. N. (1983-c). Cultural differences in the cognitive style of Mexican American students. Journal of the Association for the Study of Perception, 18 (1), 3-10.

Saracho, O. N. (1983-d). Relationship between cognitive style and teachers' perceptions of young children's academic competence. The Journal of Experimental Education, 51 (4), 184-189.

Saracho, O. N., & Dayton, C. M. (1980). Relationship of teachers' cognitive styles to pupils' academic achievement gains. Journal of Educational Psychology, 72, 544-547.

Saracho, O. N., & Spodek, B. (1981). Teachers' cognitive styles and their educational implications. Educational Forum, 45, 153-159.

Schimek, J. G. (1968). Cognitive style and defenses: A longitudinal study of intellectualization and field independence. Journal of Abnormal Psychology, 73 (6), 575-580.

Sherman, J. A. (1967). Problem of sex differences in space perception and aspects of intellectual functioning. Psychological Review, 74 (4), 290-299.

Spotts, J. W., & Mackler, B. (1967). Relationship of field-dependent and field independent cognitive styles to creative test performance. Perceptual and Motor Skills, 24, 239-268.

Thompson, B., & Pitts, M. C. (1981). Validity of teachers' perceptions of children's cognitive styles. Measurement and Evaluation, 14 (2), 90-95.

Vernon, P. E. (1972). The distinctiveness of field-independence. Journal of Personality, 40, 366-391.

Wallach, M. A. (1962). Commentary: Active-analytical vs. passive-global cognitive functioning. In S. Messick and J. Ross (Eds.), Measurement in personality and cognition (pp. 199-215). New York: John Wiley and Sons, Inc.

Winnie, P. H., & Marx, R. W. (1980). Matching students' cognitive styles to teaching skills. Journal of Educational Psychology, 72 (2), 257-264.

Witkin, H. A. (1974). Cognitive style perspective on evaluation and guidance. Proceedings of the 1973 Invitational Conference on Testing Problems--Measurement for self-understanding and personal development, 21-27. Princeton, NJ: Educational Testing Service.

Witkin, H. A., Dyk, R. B., Faterson, H. F., Goodenough, D. R., & Karp, S. A. (1974). Psychological differentiation. Potomac, MD: Lawrence Erlbaum Associates, Inc., Publishers. (Original work published 1962).

Witkin, H. A., Goodenough, D. R., & Karp, S. A. (1967). Stability of cognitive styles from childhood to young adulthood. Journal of Personality and Social Psychology, 7, 291-300.

Witkin, H. A., Hertzman, M., Machover, K., Meissner, P. B., & Wapner, S. (1972). Personality through perception. Westport, CT: Greenwood Press. (Original work published 1954).

Witkin, H. A., Moore, C. A., Goodenough, D. R., & Cox, P. W. (1977). Field-dependent and field-independent cognitive styles and their educational implications. Review of Educational Research, 47, 1-64.

Wu, J. J. (1968). Cognitive style and task performance--a study of student teachers. Dissertation Abstracts International, 29, 176A. (University Microfilms No. 68-7408).

Zigler, E. (1963). A measure in search of theory. Contemporary Psychology, 8, 133-135.

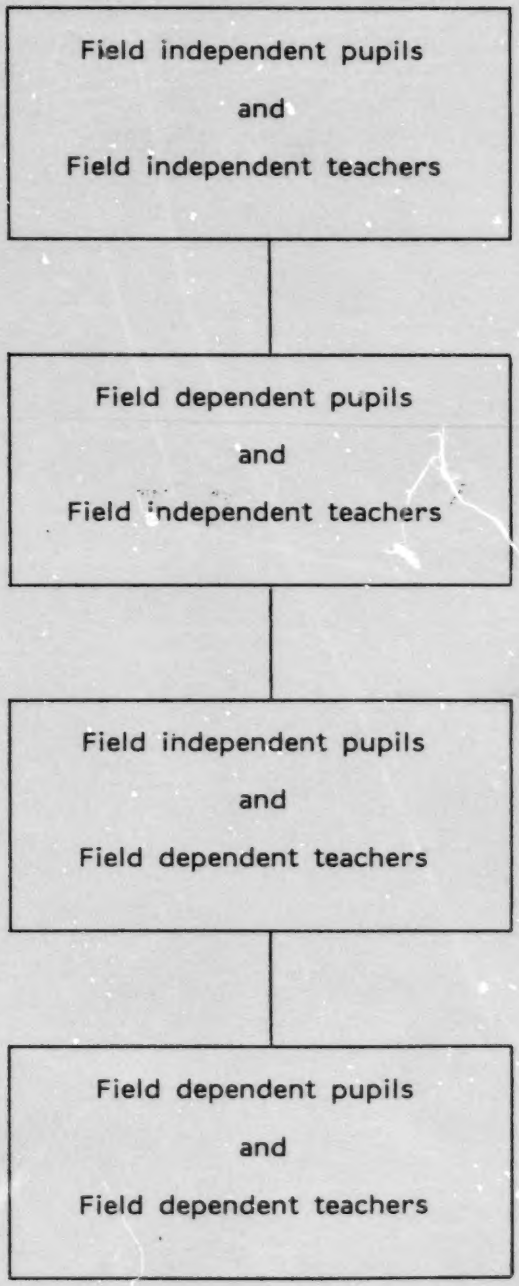

Figure 1. Proposed hierarchy of matches between pupils' and teachers' cognitive styles.